

REMARKS

In part 12 of the Office Action Summary box number 12 is not checked. However, Applicant filed a certified copy of the priority document on 27 January 2004, as indicated on the filing transmittal for this application. Therefore, Applicant respectfully requests acknowledgement of the claim for priority under section 119 and notice that the certified copy of the priority document has been received.

Applicant thanks the Examiner for initialing the form PTO 1449s that were filed on 27 January 2004 and on 6 July 2004.

Claim 2 was objected to do to informalities. Particularly, the Examiner has requested that the language “the temperature detection component detection component” be rewritten as “the temperature detection components.” However, Applicant has amended claim 2 to recite “the one temperature detection component ~~detection component~~ is used for detecting the overtemperature condition of the two adjacent power components.” This novel embodiment is disclosed in, for example, pg. 11 and shown in Fig. 2.

Therefore, because claim 2 has been amended to correct the informalities, it is respectfully requested that the objection to claim 2 be withdrawn.

Claims 1 – 8 were rejected under 35 USC 102(b) as being anticipated by U.S. Patent No. 5,355,123 to Nishiura *et al.* (hereafter “Nishiura”). For the reasons discussed below, claims 1 – 8, as amended, are now in condition for allowance.

Claims 1 and 8 have been amended to recite the novel embodiment disclosed, for example, on pg. 6, lines 6 – 8 in which at least two temperature detection components have temperature characteristics corresponding to temperature detection signals outputted from at least two of the temperature detection components, and the temperature characteristics of the at least

two temperature detection components are substantially equivalent to each other. Particularly, as shown in, for example, Fig. 3, output voltages V2a, V2b illustrate the substantial identical nature of the temperature detection components.

The novel embodiment will be described in more detail with reference to the embodiment shown in Figs. 2 – 3. The temperature detection components (D2a, D2b) are arranged adjacent to the power MOS transistors M2 an equal distance L1 therefrom. The forward voltages (temperature characteristics) of each of the temperature detection components (D2a, D2b) vary when excessive current flows through the power MOS transistor M2. That is, when excessive current flows through the transistor M2, the heat produced in the transistor M2 is transmitted to the diodes (D2a, D2b) after a time lag (for example, t_1). The forward voltages (V2a, V2b) of the temperature detection components (D2a, D2b) decrease at approximately the same rate. When the voltage (V2b) of the temperature detection component (D2b) has decreased to the reference voltage Vr2, the signal (S2b) associated with the voltage (V2b) becomes high. (See pg. 9, lines 1 – 19). When the voltage (V2a) decreases to the reference voltage Vr1, the detection signal S2a becomes high. As a result of both detection signals S2a, S2b becoming high, the detection signal Q2 indicates overtemperature condition.

Temperature detection components (D1b, D3a) can be arranged adjacent to the power MOS transistors M2 an equal distance L2 therefrom, and temperature detection components (D1a, D3b) can be arranged adjacent to the power MOS transistors M2 an equal distance L3 therefrom. Output voltages (V1b, V3a) and output voltages (V1a, V3b) illustrate the substantial identical nature of the temperature detection components.

As described above, each of the temperature detection signals of the temperature detection components substantially corresponds to the distance from the power components.

Therefore, it is possible to evaluate whether one of the adjacently arranged power components is in the over temperature condition, or whether another of the power components adjacent to the one of the power components is in the over temperature condition. Thus, as described in pg. 12, lines 3 – 7, it is possible to reduce erroneous detection in which a power component that is not in the overtemperature condition is detected as in the overtemperature condition.

Nishiura discloses an overheating detection circuit that includes a first detecting circuit 61, a second detecting circuit 62 and a hysteresis circuit 63 for receiving output signals of the first and second detecting circuits 61 and 62. The first detecting circuit 61 includes a diode 1, FET 2 and inverter 5 and the second detecting circuit 62 includes diode 3, FET 2 and inverter 5. First detecting circuit 61 or second detecting circuit 62 changes the logic state of their output signal when their respective temperature drops to a detecting temperature.

However, Nishiura fails to disclose that the temperature characteristics corresponding to temperature detection signals outputted from the temperature detection components 61, 62 are substantially equivalent to each other. Rather, Nishiura discloses that the junction area of diode 3 in second detecting circuit 62 is larger than the junction area of diode 1 in the first detecting circuit 61 such that the detecting temperature T2 of the second detecting circuit 62 is lower than that of the first detecting circuit 61. That is, Nishiura discloses that the diodes 1 and 3 have different temperature characteristics.

Further, as described in col. 8, lines 7 – 11, the hysteresis circuit 63 including NAND gates 52 and 53 performs a hysteresis operation on the basis of the temperature difference so that irregular and short period variations can be ignored. In this structure, leak currents of the diodes 1 and 3 are converted to voltage, thereby performing the hysteresis operation in order to protect the FET (power device) 2. However, because the junctions 1, 3 have temperature characteristics

that are different from each other, only one diode, which has the higher detection voltage, is effective for determining if one of the power devices is in the over temperature condition. Therefore, it is difficult to specify one power device that is in an overtemperature condition out of the multiple power devices when this detection circuit is applied to multiple power devices, which are adjacent to each, due to the different temperature characteristics.

Therefore, because Nishiura fails to disclose that the temperature characteristics corresponding to temperature detection signals outputted from the temperature detection components 61, 62 are substantially equivalent to each other, it is respectfully requested that the rejection of claims 1 and 8, as amended, be withdrawn.

Claims 2 – 7 depend from claim 1. Therefore, the rejection of these claims should be withdrawn for at least the above-mentioned reasons with respect to claim 1.

In view of the foregoing, applicant submits that this application is in condition for allowance. A timely notice to that effect is respectfully requested. If questions relating to patentability remain, the Examiner is invited to contact the undersigned by telephone.

If there are any problems with the payment of fees, please charge any underpayments and credit any overpayments to Deposit Account No. 50-1147.

Respectfully submitted,



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